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RESEARCH ARTICLE

Potentilla × *angarensis* Popov (Rosaceae Juss.) – a new taxon for the Oka-Don Lowland

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Abstract

A new locality of the taxon from the genus *Potentilla*, endemic to the flora of Russia and Kazakhstan, was discovered in Eastern Europe. Previously, *P.* × *angarensis* was recorded for the European part of Russia based on collections from Moscow Region and the Republic of Udmurtia. The paper reports the first record of this hybrid for the Oka-Don Lowland, which was found in the northeast of the Voronezh Region. The main morphological characters of the hybridogenic taxon, which distinguish it from closely related species, are listed. The general distribution of *P.* × *angarensis* is specified. An image of the herbarium specimen of the new record is presented.

Keywords

Distribution, Eastern Europe, hybridization, new record, *Potentilla argentea*, *Potentilla tergemina*, Russia, Voronezh Region

Introduction

The Oka-Don Lowland (also referred to as the Oka-Don Plain) is located in Eastern Europe in the territory of Russia and occupies a part of Ryazan, Tambov, Lipetsk, Voronezh, and Volgograd Regions, as well as the Republic of Mordovia. The plain is a vast depression located in the basins of the Oka and Don Rivers. It borders with

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Central Russia in the west, with the Volga River in the east, with the Smolensk-Moscow Uplands in the north, and in the south, it gradually narrows towards the mouth of the Khoper and Medveditsa Rivers. The northern part of the Oka-Don Lowland bounded by the Oka River was named the Meshchera Lowland. Its central and southern parts are named the Tambov Plain. The relief of the plain features vast plateaus with absolute heights of 160–180 m, which alternate with wide terraced valleys of the Don, Voronezh, Bityug, Khoper, Medveditsa, Tsna, Pra, and others rivers that stretch almost along the meridional direction. In addition to river valleys, the Oka-Don Lowland includes areas with varying degrees of relief dissection by ravines and gullies (Zanin 1967).

The paper reports the first record of the taxon *Potentilla* × *angarensis* Popov from the Oka-Don Lowland, which is endemic to the flora of Russia and Kazakhstan. According to the botanical geographical zoning proposed in Flora of the European Part of the USSR (Bobrov et al. 1974), the Oka-Don Lowland is located in the Volga-Don and Nizhne-Don floristic subregions of Eastern Europe. For these subregions, 27 and 21 species of the genus *Potentilla* are reported, respectively, with no *P.* × *angarensis* Popov recorded (Kamelin 2001). In individual regions located on the Oka-Don Lowland, the following number of species of the genus *Potentilla* is reported. The number of species in the flora of Volgograd Region (Reshetnikova 2018) and the Republic of Mordovia (Silaeva et al. 2010) amounts to 18, and 16 species each are found in Ryazan (Kazakova 2004), Lipetsk (Kazakova et al. 1996), and Tambov Regions (Sukhorukov et al. 2010). The number of species in the flora of Voronezh Region is 25 species (Kamyshev 1978; Tsvelev 1988; Agafonov 2006). No *P.* × *angarensis* Popov has been found in all the above regions. In the flora of Eastern Europe, this hybrid is recorded only for the Moscow Region (Vinogradova et al. 2017; Shcherbakov, Lyubeznova 2018), and the Republic of Udmurtia (Baranova, Puzyrev 2012).

Material and methods

Two interesting herbarium specimens were found during the revision of the materials of the genus *Potentilla* L. in the fund collections of the Herbarium named after Professor B. M. Kozo-Polyansky, Voronezh State University (VOR). Each specimen contained one plant in the bud-formation period collected in the same area. We identified these herbarium specimens using identifiers for the genus *Potentilla*, including the territories of Eastern Europe and Asia (Kamelin 2001; Soják 2004, 2012a). The plant was identified as *P.* × *angarensis*, a hybrid species described from Eastern Siberia. The specimens used for comparison were the type specimens stored in Herbaria A (Index of Botanical Specimens 2020); E (Rob Cubey 2018); K (Royal Botanic Gardens, Kew 2020); NSK (Kovtonyuk et al. 2020); MW (Seregin 2020); PE (China, Beijing); US (The United States National Herbarium 2020), as well as Herbarium ALTB specimens (Russia, Barnaul). The specimens collected in Voronezh

Region were morphologically identical to *P.* × *angarensis* and materials collected in Siberia and Kazakhstan. Herbarium acronyms are listed according to Index Herbariorum (Thiers 2020).

Results and discussion

For the first time, *P.* × *angarensis* is reported for the flora of the Oka-Don Lowland. The hybrid was collected in Voronezh Region. This region is located in the central zone of the European part of Russia. The administrative-territorial division includes 31 municipal districts and three urban districts: Voronezh, Borisoglebsk, and Novovoronezh. According to the herbarium labels, plants were found near the railway station in the Borisoglebsk town on the northeast of the region. Below we present the original label (it is similar for both samples) that indicates the corresponding barcodes and provides an image of one of the herbarium specimens of *P.* × *angarensis*.

Herbarium label data: "Воронежская область, город Борисоглебск, ж/д станция, насыпь ж/д полотна. 1.06.2010. Разумова Е.В." [Voronezh Region, Borisoglebsk, railway station, railroad track embankment. 1 Juny 2010. E.V. Razumova]. The barcodes assigned to the herbarium specimens are VOR0005366 and VOR0005368 (Fig. 1). On the site of Herbarium VOR, the data on these samples contain the geographical coordinates corresponding to the collection site: 51° 21′ 24.64″ N, 42° 5′ 26.72″ E (Bedenko 2020). The distribution of *P.* × *angarensis* in the flora of Eastern Europe and specifically in the Voronezh Region is shown on the map (Fig. 2).

According to the author, *P.* × *angarensis* is a hybrid taxon resulting from crosses between *P. multifida* L. and *P. impolita* Wahlenb. (= *P. argentea* L. s. l.) (Popov 1957). The hybrid was described based on collections from South Siberia. Below we cite the original protologue data and provide information on the type material of *P.* × *angarensis*.

Protologue: "4025. × *Potentilla angarensis* M. Pop. sp. nova = *P. multifida* L. × *P. impolita* Wahlb. Foliolis tenuissime laciniatis a *P. argentea* L. et *P. impolita* Wahlb. distincta. M. Popov. Иркутская обл., Ангарск, на склоне бугра в редком сосняке у дороги. Собр. М. Попов. – Prov. Irkutsk. Opp. Angarsk in pineto collucato apud viam. Leg. M. Popov. 1955 VII 23" [4025. × *Potentilla angarensis* M. Pop. sp. nova = *P. multifida* L. × *P. impolita* Wahlb. Foliolis tenuissime laciniatis a *P. argentea* L. et *P. impolita* Wahlb. distincta. M. Porov. Irkutsk obl., Angarsk, a hillside in a sparse pine forest near the road. Collected by M. Popov. – Prov. Irkutsk. Opp. Angarsk in pineto collucato apud viam. Leg. M. Porov. 1955 VII 23] (Popov, 1957: 18).

Type. Holotype: "4025. × *Potentilla angarensis* M. Pop. sp. nova = *P. multifida* L. × *P. impolita* Wahlb. Foliolis tenuissime laciniatis a *P. argentea* L. et *P. impolita* Wahlb. distincta. M. Porov. Irkutsk obl., Angarsk, on a hillside in a sparse pine forest near the road. Collected by M. Popov. – Prov. Irkutsk. Opp. Angarsk in pineto collucato apud viam. Leg. M. Porov. 1955 VII 23" (MW, MW0592742!).

Figure 1. Herbarium specimen VOR0005368.

Figure 2. Distribution of *P.* × *angarensis* in the flora of Eastern Europe and specifically in Voronezh Region: black dots indicate previously known locations; a red dot indicates a new location.

Isotypes: A, A00019643; E, E00664154; K, K000762371; NSK, NSK0000713!; PE, PE01656588!; US, US00095522.

J. Soják, a well-known researcher of the genus *Potentilla*, in one of his works suggested that *P.* × *angarensis* could have resulted from crosses between *P. argentea* and *P. tergemina* Soják (Soják 1987). In this work, J. Soják (1987) described *P. omissa* Soják, which, in his opinion, was derived from the hybridization between *P. argentea* and *P. multifida*. Authentic *P. omissa* materials are numerous and originate from various locations in North Kazakhstan, the southern part of East Siberia, and the Russian Far East (Soják 1987). It is extremely difficult to distinguish *P.* × *angarensis* from *P. omissa*. According to J. Soják, the hair length of *P. omissa* is 0.3–1.3 mm, and the hair length of *P.* × *angarensis* is 1.2–2.5 mm (Soják 1987, 2004, 2009, 2012a, 2012b). Therefore, the length of petiole hairs is the only character to distinguish these closely related taxa. The length of petiole hairs of *P.* × *angarensis* collected in Voronezh Region exceeds 1.5 mm, which corresponds to the main character distinguishing it from the closely related *P. omissa*.

Since the difference between *P.* × *angarensis* and *P. omissa* is insignificant and not always obvious, J. Soják attempted to prove their hybrid nature experimentally (Soják 1987, 2012a). The author conducted the following hybridization experiments. First, he artificially crossed the putative parental species: exact copies of the natural species *P.* × *angarensis* were obtained from hybridization between *P. argentea* and *P. tergemina*; hybrids *P. argentea* and *P. multifida* were found to be identical to specimens of *P. omissa* from natural populations studied in nature in South Siberia (Soják 1987, 2012b).

P. × *angarensis* was recently reported as a new taxon for the flora of Kazakhstan, with subsequent records for East Kazakhstan Region (Kechaykin et al., 2020a, 2020b). Based on the literary data and our own data, we specify the species distribution.

General distribution. Eastern Europe: Moscow (Vinogradova et al. 2017; Shcherbakov, Lyubeznova 2018) and Voronezh Regions, the Republic of Udmurtia (Baranova, Puzyrev 2012); southern parts of West and East Siberia and the Russian Far East: from the Urals to Vladivostok (Popov 1957; Soják 1987, 2004, 2009, 2012); Kazakhstan: East Kazakhstan and Almaty Regions (Kechaykin et al., 2020a, 2020b).

The range of *P. omissa* is narrower and extends from North Kazakhstan to the southern regions of the Russian Far East (Soják 2004). According to some reports, *P. omissa* also grows in northwestern China (Soják 2012a). *P.* × *angarensis* and *P. omissa* can often be found in the areas of intersection of the populations of parental species. However, they began to spread along the roads regardless of their parents. The outbreak of these hybrid species probably co-occurred with the colonization of Siberia and the construction of roads and large oil and gas processing enterprises. Their typical habitat is grassland along the banks of water bodies and various semicultural communities along the roads. Both taxa tend to spread in areas of considerable human activity: in clear-cuts, near mines and pits, on dumps, and around construction sites.

Conclusion

In Eastern Europe *P.* × *angarensis* grows in three regions: Moscow and Voronezh Regions and the Republic of Udmurtia. It has been experimentally proven that the species resulted (and results) from hybridization between *P. argentea* and *P. tergemina*. The taxon prefers habitats subject to considerable human activity and actively spreads along roads and railways regardless of the populations of parental species. Therefore, it can be assumed with reasonable assurance that *P.* × *angarensis* can be found in many other regions from Moscow (possibly to the west) to Vladivostok, along the Trans-Siberian Railway.

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